Sugar Cane Field Monitoring and Security System

N.M.Sai Krishna, K.Mahesh Babu, R. Priyakanth,
K.Ashwitha,N.Harshitha,V.Samyuktha,D.Srujana,T.Navya
 # Electronics And Communication Department,
Bvrit Hyderabad College Of Engineering For Women
(Approved By Aicte, New Delhi And Affiliated To Jntuh, Hyderabad)
Bachupally, Hyderabad – 50009, India

ABSTRACT-_The main aim of our project is to provide security and maintenance to the sugarcane field through the following functionalities:_

1. Facilitate the farmer by providing with data, regarding the weather forecast (temperature and humidity) of the field to his/her mobile.
2. Provide the convenience of automatic watering to the crop when the field is dry on the basis of moisture level.
3. Alerting the farmer regarding the motion of predators like insects and pests and also the bandicoot rats which damage the crop in sugarcane fields.

Often farmer's hard work is destroyed by the predators like insects and pests that results huge loss to farmers. To avoid such situation we made a system that detects the motion of predators using PIR sensors. This information can be used by the farmers to reduce the damage done by the predators.

I. INTRODUCTION

The sugarcane fields are mostly prone to bandicoot rats which are a great challenge for farmers these days. So this system helps the farmer to get the alert when the rats enter the field. This reduces the manual work done by the farmer and also makes his work easier. The collected data provides the information about the various environmental factors.

II. COMPONENTS

- Arduino
- GSM Module
- Moisture Sensor
- Temperature Sensor
- Humidity Sensor
- PIR Sensor
- DC Motor
- Buzzer

A. Arduino Uno:

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

1.) Features of Arduino Uno:

- It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes.
- It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it.
- It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.
- It has 13 digital pins and 6 analog pins. This sort of pins allows you to connect hardware to your Arduino Uno board externally.
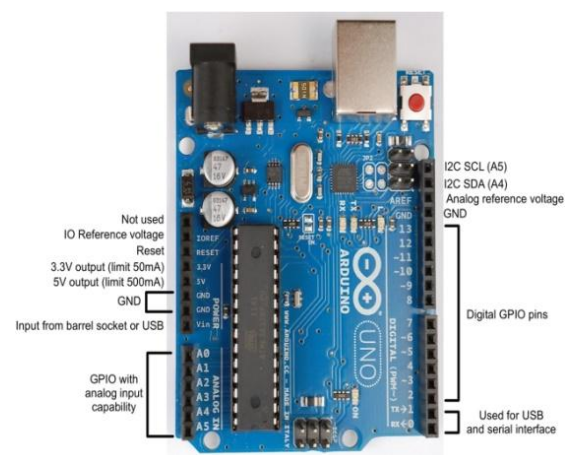

Fig. 1 Arduino Uno

B. GSM Module:

The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. Witha tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design. This is an ultra-compact and reliable wireless module.

1.) Features:

- Dual-Band 900/ 1800 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA(sleep mode)'
- Operation temperature: -40°C to +85 °C
- Status indicator (D5):It will flashes continuously whenever the call arrives otherwise it is left ON.
- Network LED (D6): This led will blink every second which indicates that the GSM module is not connected to the mobile network. Once the connection is established successfully, the LED will blink continuously every 3 seconds.

Fig. 2SIM 900 A GSM Module

C. Moisture Sensor:

The Soil Moisture Sensor uses capacitance to measure the water content of soil (by measuring the dielectric permittivity of the soil, which is a function of the water content). Simply insert this rugged sensor into the soil to be tested, and the volumetric water content of the soil is reported in percentage.
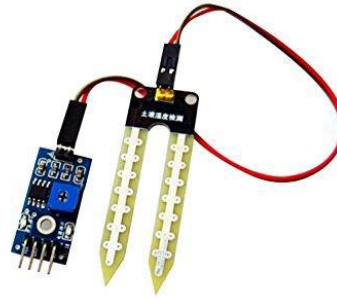

Fig. 3 Moisture Sensor

The soil moisture sensor is created by the use of galvanized iron nails. These iron nails are fixed in the non-conducting plastic foam which create insulation in between them. These two nails of sensor are dipped into soil whose moisture has to be determined. The soil moisture is determined by calculating the conductivity or resistivity between these two nails. If the moisture content of soil is low, then the resistivity between the nails is high or the conductivity between them is low and as the moisture content increases, conductivity increases and resistivity decreases.

D. Humidity Sensor:

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

1.) Features:

- Low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)
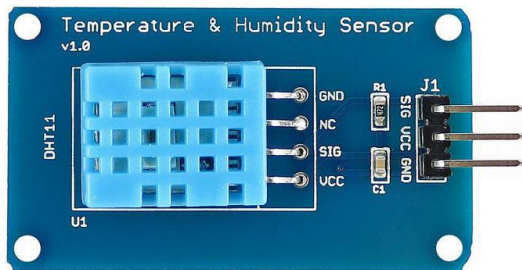- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

Fig. 4 DHT11

E. PIR Sensor:

A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically-activated lighting systems. They are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector".

Fig. 5 PIR Sensor

*1.) Working of PIR Sensor:*When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body of a human or an animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves.

When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected. The term passive in this instance refers to the fact that PIR devices do not generate or radiate energy for detection purposes. They work entirely by detecting infrared radiation emitted by or reflected from objects. They do not detect or measure "heat".

F. DC Motor:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications

Fig. 6 DC Motor

G. Buzzer:

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

A buzzer is a device which makes a buzzing or beeping noise. There are several kinds; the most basic is a piezoelectric buzzer, which is just a flat piece of piezoelectric material with two electrodes.

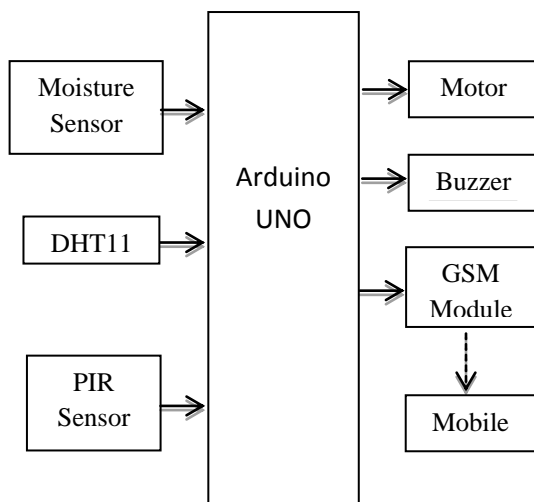Fig. 7 HXD Buzzer

III. WORKING

Fig 8 Block Diagram

The project mainly does the following functions:

1. Facilitate the farmer by providing with data, regarding the weather forecast (temperature and humidity) of the field to his/her mobile.
2. Provide the convenience of automatic watering to the crop when the field is dry on the basis of moisture level.
3. Alerting the farmer regarding the motion of predators like insects and pests and also the bandicoot rats which damage the crop in sugarcane fields.

1.) WEATHER FORECAST INFORMATION:

This section consists of three sections - one senses the humidity and temperature by using humidity and temperature sensor DHT11. The second section reads the DHT sensor module's output and extracts temperature and humidity values into a suitable number in percentage and Celsius scale. And the third part of the system displays humidity and temperature on mobile through GSM Module. Working of this project is based on single wire serial communication. First Arduino send a start signal to DHT module and then DHT gives a response signal containing temperature and humidity data. Arduino collects and extract in two parts one is humidity and second is temperature and then send them to GSM Module. The GSM module sends this data to the mobile phone.

2.) AUTOMATIC CROP WATERING BASED ON MOISTURE LEVEL:

By using the concept of modern irrigation system a farmer can save water up to 50%. This concept depends on two irrigation methods those are: conventional irrigation methods like overhead sprinklers, flood type feeding systems i.e. wet the

lower leaves and stem of the plants. The area between the crop rows become dry as the large amount of water is consumed by the flood type methods, in which case the farmer depends only on the incidental rainfalls or manual watering of the plants.

Instead of this manual watering of the field whenever it becomes dry, the automatic watering system can make the work of the farmer very easier.

Working of this Automatic Plant Irrigation System is quite simple. First of all, it is a Completely Automated System and there is no need of manpower to control the system. Arduino is used for controlling the whole process and GSM module is used for sending alert messages to user on his Cell phone.

If moisture is present in soil then there is conduction between the two probes of Soil Moisture sensor and due to this conduction, transistor Q2 remains in triggered/on state and Arduino Pin remains Low. When Arduino reads LOW signal at pin, then it sends SMS to user about "Soil Moisture is Normal. Motor turned OFF" and DC Motor remains in OFF state.

Now if there is no Moisture in soil then Transistor Q2 becomes OFF and Pin D7 becomes High. Then Arduino reads the Pin and turns On the DC motor and also sends message to user about "Low Soil Moisture detected. Motor turned ON". Motor will automatically turn off when there is sufficient moisture in the soil.

3.) INTRUDER ALERT SYSTEM:

The sugar cane fields are often prone to bandicoot rats whose prevention is a big challenge to the farmer of the field. These bandicoot rats usually attack the field during the night and the farmer will be unknown about their entry. So, the farmer is alerted when such rats enter into the field using PIR sensor and passes the information to the farmer's mobile so that he can take the necessary action.

Firstly, when the rats enter the field the PIR sensor senses their presence and passes the information to the corresponding Arduino pin. When the Arduino receives the information from the PIR sensor, it triggers the buzzer and an alert in sent to the farmer.

IV. ADVANTAGES

- Reduces water consumption
- Reduces man power
- Cost efficient
- Low power consumption
- Easily operable
- Reduces the work of continuous monitoring by the farmer
- More timely irrigation

- Assists in the management of higher flow rates
- More accurate cut-off
- Reduced runoff of water and nutrients
- Reduced costs for vehicles used for irrigation
- Sustain high Yielding
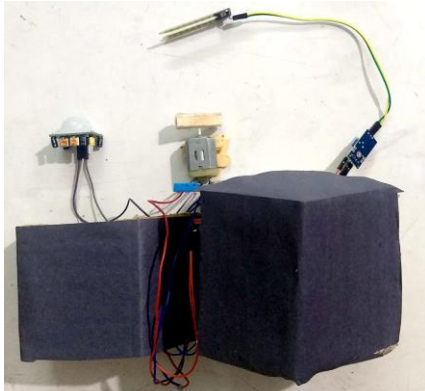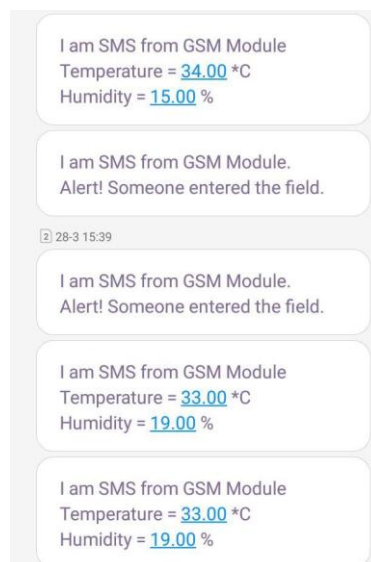- High Quality Crop Production

V. Output

Fig. 9 Output

Fig. 10 Screenshot

VI. CONCLUSION

We have developed an automatic irrigation system, monitoring system, intruder alert system which switches the pump motor on sensing the moisture content of the soil, sending humidity and temperature values of the field, alerting the farmer when intruder enters respectively. In the field of agriculture the monitoring system is very necessary. The advantages of using this method is to reduce human intervention and reduces his work and still ensure proper irrigation. It makes the appropriate use of water resources improve the health arid life of plants.

REFERENCES

[1] Stipanicev D., Marasovic J.,‖ Network embedded greenhouse monitoring and control‖, Proceedings of 2003 IEEE Conference on Control Applications Turnell, D.J. deFatima, Q.V.,

[2] *Automated Agriculture System based on WSN* S Yoo, J Kim, T Kim, S Ahn, J Sung… - … , 2007. ISCE 2007. IEEE …, 2007

[3] Wireless sensors in Agriculture and food industry—Recent development and future perspective

[4] Automatic Drip Irrigation System – Electronics For You (October 2017)

[5] http://ieeexplore.ieee.org/document/8081906/

[6] https://www.irjet.net/archives/V4/i3/IRJET-V4I303.pdf

[7] http://ieeexplore.ieee.org/document/7996640/

[8] https://www.researchgate.net/publication/283331223_Agriculture_monitoring_system_A_study

Mr. N. M. SaiKrishna received a B.Tech degree in Electronics &Communication Engineering from, Anna University, Chennai, T.N, India and M.Tech degree from JNTU Kakinada, A.P, India in 2008 and 2012 respectively.Having 7 years of teaching experience he is working as Assistant Professor in the department of Electronics and Communication Engineering in BVRIT Hyderabad College of Engineering for Women, Hyderabad, Telangana, India. His areas of interest are IOT and VLSI and Applications.

Mr. K.Mahesh Babu received B.Tech degree in Electronicsand Communication Engineering from, Andhra University, A.P, India and M. Tech degree from JNTU Hyderabad, A.P, India. Having 11 years of teaching experience he is working as Assistant Professor in the department of Electronics and Communication Engineering in BVRIT Hyderabad College of Engineering for Women, Hyderabad, Telangana, India.

R.Priyakanth received B.Tech degree in Electronics & Control Engineering from PVP Siddhartha Institute of Technology, Vijayawada, A.P, India and M.Tech degree in Communication and Radar Systems from K L University, Vaddeswaram, Guntur Dist., A.P, India in 2002 and 2005 respectively. Having 13 years experience in teaching and 1 year in industry, currently he is working as Asst. Professor in the department of Electronics and Communication Engineering, BVRIT Hyderabad College of Engineering for Women, Hyderabad, Telangana, India. He is pursuing his research under JNTUK, Kakinada in Multimodal Signal Processing. His other research interests include Bio-Medical Imaging and IOT.

Ms K.Ashwitha is pursuing B. Tech degree in Electronics and Communication Engineering from BVRIT Hyderabad College of Engineering for Women, Telangana, India. Her areas of interest include IOT.

Ms N.Harshitha is pursuing B. Tech degree in Electronics and Communication Engineering from BVRIT Hyderabad College of Engineering for Women, Telangana, India. Her areas of interest include IOT, Embedded Programming.

Ms V.Samyuktha is pursuing B. Tech degree in Electronics and Communication Engineering from BVRIT Hyderabad College of Engineering for Women, Telangana, India. Her areas of interest include Designing and IOT.

Ms D.Srujana is pursuing B. Tech degree in Electronics and Communication Engineering from BVRIT Hyderabad College of Engineering for Women, Telangana, India. Her areas of interest include IOT.

Ms T.Navya is pursuing B. Tech degree in Electronics and Communication Engineering from BVRIT Hyderabad College of Engineering for Women, Telangana, India. Her areas of interest include IOT and Programming.